KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food. Engg.) 2016 Admission
V Semester Final Examination-January 2019

Meen. 3106 **Systems Engineering (1+1)**

Marks: 50
Time: 2 hours

I **Choose the correct answer** **(10x1=10)**

1 In graphical representation the bounded region is known as _____ region
(a) solution (b) feasible solution (c) basic solution (d) optimal

2 A constraint in an LP model restricts
(a) value of the objective function (b) use of the available resources
(c) value of the decision variable (d) all of the above

3 A feasible solution of LPP
(a) Must satisfy all the constraints simultaneously (b) Need not satisfy all the constraints, only some of them
(c) Must be a corner point of the feasible region (d) all of the above

4 Alternative solution exists in a linear programming problem when
(a) One of the constraint is redundant (b) Objective function is parallel to one of the constraints
(c) Two constraints are parallel (d) All of the above

5 Transportation problem is basically a
(a) Maximization model (b) Minimization model
(c) Transshipment problem (d) Iconic model

6 In transportation model, the opportunity cost is given by
(a) Implied cost + Actual cost of the cell (b) Actual cost of the cell – Implied cost,
(c) Implied cost – Actual cost of the cell (d) Implied cost × Actual cost of the cell

7 When the elements of net evaluation row of simplex table are equal, the situation is known as
(a) Tie (b) Degeneracy (c) Break (d) Shadow price

8 If an activity has zero slack, it implies that
(a) It lies on the critical path (b) It is a dummy activity
(c) The project progressing well (d) None of the above

9 The role of artificial variables in the simplex method is
(a) to aid in finding an initial solution (b) to find optimal dual prices in the final simplex table
(c) to start with Big M method (d) all of these

10 As per queue discipline the following is not a negative behavior of a customer:
(a) Balking (b) Reneging (c) Boarding (d) Collusion

II **Write Short notes on any FIVE of the following** **(5x2=10)**

1 List out the applications of operations research.
2 Linear Programming.
3 List any four requirement of employing linear programming problem techniques.
4 Basic assumptions for solving linear programming problems.
5 Unbalanced transportation problem.
6 Limitations for operation research.
7 Dynamic Programming.

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III **Answer any FIVE of the following.** **(5x4=20)**

1 What is the Procedure for forming a Linear Programming Problems Model?

2 Advantages of linear programming.

3 Characteristics of dynamic programming problems.

4 Maximize $f(\mathbf{x}) = x_1 + 2x_2$ subject to:

$$\begin{cases} x_1 + 2x_2 \leq 3 \\ x_1 + x_2 \leq 2 \\ x1 \leq 1 \\ x_1 \geq 0 \\ x2 \geq 0 \end{cases}$$

5 Customers arrive at a one-man barber shop according to a Poisson process with mean inter-arrival time of 12 minute, Customers spend an average of 10 min in the barber's chair. What is the expected number of customers in the barber shop and in the queue? How much time can a customer expect to spend in the barber's shop?

6 If the inter-arrival time and service time in a public telephone booth with a single phone follow exponential distributions with means of 10 and 8 minutes respectively, Find the average number of callers in the booth at any time.

7 Describe the applications of Network Analysis (PERT and CPM).

IV **Solve the following questions(ANY ONE)** **(1x10=10)**

1 Maximize $f(\mathbf{x}) = x_1 + 2x_2 + x_3$ subject to:

$$\begin{cases} x_1 + 2x_2 + x_3 \leq 2 \\ 3x_1 + x_2 + x_3 \leq 4 \\ x_1 + x_2 + 2x_3 \leq 4 \\ x_1 + x_2 + x_3 \leq 2 \\ x_1 \geq 0 \\ x_2 \geq 0 \\ x_3 \geq 0 \end{cases}$$

2 Using the information in Table 1, assuming that the project team will work a standard working week (5 working days in 1 week) and that all tasks will start as soon as possible:

Table 1

Task	Description	Duration (Working Days)	Predecessor/s
A	Requirement Analysis	5	
B	Systems Design	15	A
C	Programming	25	B
D	Telecoms	15	B
E	Hardware Installation	30	B
F	Integration	10	C,D
G	System Testing	10	E,F
H	Training/Support	5	G
I	Handover	5	H

(i) Determine the critical path of the project (3 marks)

(ii) Calculate the planned duration of the project in weeks (3 marks)

(iii) Identify any non-critical tasks and the float (free slack) on each. (4 marks)